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THE TRAIN OF THOUGHT

AN EXPERIMENTAL STUDY OF THE INSANE

BY

CLARA HARRISON TOWN, PH. D.

RESIDENT PSYCHOLOGIST, FRIENDS ASYLUM FOR THE INSANE,

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THESIS

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THE TRAIN OF THOUGHT.

In observing and studying experimentally the patients at Friends' Asylum for the Insane, Frankford, one test has proved especially fruitful of results.

The test is that used by Prof. Lightner Witmer for the study of association. The subject is required to write a list of words, one below the other, during a period of fifteen minutes. He is directed to write without pause or choice each word as it occurs to him. The experimenter records the number of words written during the first two minutes, and during the first, second and third periods of five minutes each. This fifteen minute test furnishes material for the study of (1) the forms of association, (2) the quality of the ideas expressed (perceptual or conceptual), (3) the thought content, (4) the rapidity of thought, (5) the effect of practice and fatigue, (6) the degree of concentration of thought, and (7) the degree of the power of application.

The trend of thought is not controlled in any way by the experimenter, and the subject writing freely for a period of fifteen minutes, rarely fails to include many words indicative of his individual interests and pursuits. In an insane subject this tendency is of especial value as delusions are often expressed which would not be betrayed in conversation or in a shorter written test. From an examination of such a list, therefore, the investigator is usually able to determine the general trend of the writer's thought, *i.e.* to determine whether he is literary or scientific in his tastes, or whether he is principally occupied with the daily routine of events either in the narrow field of personal experience, or in the larger sphere of the world's activities. A still closer study of the written words will reveal whether the subjects' thoughts have been chiefly perceptual in character, *i.e.* memory images (individual or gen-

eral) of past experiences, or conceptual, *i.e.* thoughts so far removed from a percept in character as to be essentially abstract.

The effect of practice and fatigue is learned by a comparison of the number of words written during the first, second and third periods; the degree of concentration is indicated by the length of the uninterrupted trains of thought, and the degree of application by the continuity of the effort, by the amount of distractibility evinced during the test.

Lists of words have been secured from forty-five patients. They have been analyzed with regard to the seven phenomena above enumerated, and the results will be presented and discussed consecutively.

Association.

I shall first consider the merits of the method used as applied to the study of the forms of association.

Wundt, (16*), Trautscholdt (15), Scripture (14), Münsterberg, (10), Aschaffenberg (1), Howe (6), Smith (13), Cattell (3), Frances Kellor (8), and Peterson and Jung, (12, 7), in their experiments on association all apply a stimulus, either a word, a touch or other sensory stimulus, and record the first associated word, or a series of words following this stimulation. These methods test the associations resulting from the application of certain discrete stimuli, but their results throw no light upon the general trend of association in thought uncontrolled by external stimuli, as does the method here employed. Moreover, it is frequently difficult and sometimes quite impossible to induce an insane subject to respond at all to such stimulation. The effort has to be repeated with each stimulation and the experimenter can rarely be confident that the subject is giving maximum attention to the stimulus, or expressing the first associated thought. Once persuaded to write, however, it is comparatively easy to hold such a subject to the completion of the task.

Aschaffenberg (1) in addition to the method above described used one resembling that used by Prof. Witmer. It differed in

*These numbers refer to the Bibliography, pp. 52 and 53.

that it controlled the number of words written instead of the time employed in writing them, requiring the subject to write just one hundred words, regardless of time. This method, though similar, does not possess all the possibilities of the longer test which were enumerated above. It is, moreover, inapplicable to use with insane subjects, as many of them are quite incapable of writing one hundred words consecutively. The methods used by Prof. Cattell (3) and Miss Kellor (8) are similar to that of Prof. Witmer in that they require the subject to write a list of words, but they differ from it in applying a stimulus to initiate the train of thought and also, very materially, in the time limit. Prof. Cattell's subject wrote during twenty seconds and Miss Kellor's during one minute. Both of these periods are far too short for general use with insane subjects, many such subjects requiring longer periods for one association reaction.

To attain any degree of uniformity of test with the insane, I have found it necessary to limit the time, not the number of words, the shortest lists can then be included in groups for the purpose of correlation and comparison. I have found also that much more characteristic lists are written when the subject writes for a period of fifteen minutes. This time might be lengthened with advantage but should never be shortened. In addition, then, to the light it throws on other mental processes, the fifteen minute association test seems better adapted than other association tests for gathering material for a study of association, especially when the individuals studied are insane.

FORMS OF ASSOCIATION.

The forty-five lists of words furnished a mass of associations which it was my first task to analyze and classify.

Starting with the assumption that all associations are the result of neural habit, we may, in this sense, call them all contiguity associations. When a certain brain area is stimulated, the excitation tends to spread to all those areas previously stimulated with it; and when a brain area is stimulated a state of consciousness exists similar to that accompanying its previous stimu-

lation. These two hypotheses are the basis of the theory of association.

In an adult brain every area must have myriads of associated areas, and every idea, therefore, myriads of previously associated ideas which it might possibly recall; indeed the possible associations of any idea seem to be limited only by the previous mental experience of the individual. The fact that it is frequently not obvious that recalled ideas are dependent upon contiguity association is accounted for by the theory that ideas do not recall others as a whole but through their elements. An associated idea may be made up of many elements, only one of which need be directly related by contiguity to the stimulus word or to one of its elements. The associated idea as a whole, therefore, may never have been experienced in conjunction with the stimulus word, indeed it may be an entirely new combination of elements. Just as the fine muscular movements used in articulation may be combined so as to produce any one of the some three hundred and eighty thousand words in the English language and in addition an unlimited number of words from other tongues, so, in a highly cultivated mind, may the elements of ideas be combined and recombined *ad infinitum*.

Which element will be most active as a recalling agent will depend upon the past mental experience of the individual and the resulting tendency of his mental activity, modified by the mood of the moment, in short on what aspect of the stimulus is *most interesting* to the individual at the time.

With some persons the interest is much diffused and there is a probability of sensorial associations, or of a form of ideational association which depends for its existence on the association of the two ideas in some past experience. With others the interest is more and more focalized and the aroused ideas are either similar in meaning or recalled by the meaning of the stimulus word. Thus a word may suggest others by its sound, or by the sound of any of its letters or syllables; by its appearance, or by the appearance of any of its letters or syllables; by its meaning or the meaning of any of its parts; it may suggest a word previously associated with it in speech habit, or words and ideas previously associated with it in experience though not habitually. We therefore classify

associations, all of which are made possible by the facts of neural habit or the law of contiguity, according to these several methods of recall.

Before adopting a form of classification I have carefully examined those used by Wundt (16), Trautscholdt (15), Kraepelin (9), Aschaffenberg (1), Münsterberg (10), Ziehen (17), Orth (11), Claparède (5), Cattell and Bryant (3), Calkins (4) and Bourdon (2).

Münsterberg's (10) is inapplicable to the method employed as it applies only to reactions obtained from a noun, a verb, or an adjective stimulus. The classifications of Ziehen (17), Orth (11), and Claparède (5) require too much introspective evidence from the subject to be of practical value with insane patients. Ziehen's (17) main division is based on the presence or absence of a judgment, Orth's (11) on the presence or absence of accompanying or intervening facts of consciousness. Claparède's is founded upon differences in the psychological value of the associations. His associations without value include repetitions, exclamations, and free associations, *i.e.* those which have no apparent connection with the stimulus word. He subdivides his associations with value into those which are accompanied by a consciousness of the associative relation and those which are not. Bourdon's (2) is a three-fold classification embracing ideational (significant), phonetic and grammatical associations. His subdivisions of the first group are very minute, and his classification as a whole is most clear and complete.

Wundt (16), Trautscholdt (15) and Kraepelin (9) divide all associations into two classes, internal and external. The internal includes all cases in which the objects associated are purely ideal; the external all those in which the association is of objects of the external world. This distinction is made by Aschaffenberg, and Bourdon also retains the classification as a subdivision though he changes the terminology. Cattell's (3) classification makes this distinction the fundamental one, though it appears as in Bourdon's classification under a new nomenclature. Cattell calls the external class objective and describes it as comprising those associations due to previous connection in sensation; he calls the internal class logical, and groups under this heading all associations due to thought. These main groups he subdivides

again according to the time relations of the associated words:—the objective into coexistence and succession, the logical into specification and causation. These subgroups are further subdivided according to the logical relations of the ideas. The following is a copy of his scheme of classification.

1. Objective Associations	a. Coexistence	Coördination	
		Whole to part	
		Part to whole	
	b. Succession	Forward	
		Back	
2. Logical Associations	a. Specification	Correlation	
		Generalization	
		Specialization	
	b. Causation	Final	
		Efficient	

Miss Calkins (4) bases her classification on the degree of focalization of interest in the stimulus, or in other words, on whether the recalling agent acts as a concrete whole or through its elements. Her first class contains "Total or concrete associations," her second, "Partial association of elements of consciousness," subdivided into "Multiple," in which the starting point of the association is a large group of persisting elements and "Focalized" in which the starting point is a single element or a small group. "The extreme forms," writes Miss Calkins, "are obviously characteristic of opposing types of intellect, the literal and prosaic ..... and the penetrative and creative, which singles out remote and subtle elements and qualities of its gross content." In the light of our results this distinction, though very prominent, does not seem so fundamental as the distinction between the class of associations in which the meaning of the stimulus acts as the recalling agent, and the class in which the sensory impression is alone active. If we make this our fundamental distinction we

find that we can further subdivide each group according to the degree of focalization.

When the stimulus acts through its meaning there are present varying degrees of apperceptive activity; when on the other hand the stimulus makes such a superficial impression that its sensory characteristics claim the entire attention and one word follows another simply linked by sound, appearance or habit, there is a strong indication that the mentality is simply passive: and just here we have the great fundamental difference of mental activities, the difference between active, logical thought, guided by dominant motives and the passive flow of ideas depending upon the chance impression of a moment. It is here too that we appreciate the futility, the hopelessness of the attempt to explain all thought processes by any theory of association. In many insane subjects the associations are unimpeded, rapid and inclusive, one woman, for instance, entirely incapable of reason, wrote for me 330 words in fifteen minutes of which 94% were associated one with another: another woman, a dementia praecox case, wrote 112 words, never once breaking the chain of association.

Associative power is wonderfully retained by the insane, and indeed seems to run riot in its absolute sway: what one misses is the presence of goal ideas, of concentrated motives to control and direct the associative activity. Facing these conditions we can but think that psychological association considered as a causal activity breaks down entirely when one tries to apply it to logical thought. That there is any train of thought at all depends, of course, on neural habit and when the train is one of superficial, sensorially aroused associations, associative activity might suffice as an explanation, but when the stimulation arouses great mental activity, which thought will follow another seems to be determined not so much by the stimulus as by the nature of the apperceptive mass itself, and it seems nearer the truth to say that the apperceptive mass acts upon the new impression than that the impression acts upon it.

This difference between sensorial and ideational associations appears to me to be a fundamental difference, one marking the step from undirected passive thought to active apperceptive thought, and I have therefore made it the basis of my classifica-

tion. This difference is secondarily recognized in the classifications of Aschaffenberg and Bourdon.

I have omitted the distinction between objective and logical association as it appears to me to represent a difference in the quality of the ideas after their recall, and not to indicate any difference in the method of association, which is all that the present classification aims to embrace. When the idea, "courage," for instance, leads to an enumeration of qualities and the idea, "pine," to an enumeration of trees, the results seem to depend upon the same principle of association—coördination. The fact that logical ideas are aroused by the word "courage" and objective ones by the word "tree" is determined, it seems, not by any difference in associative processes, but by the difference in quality of the stimulating words, "courage" and "tree". Some experimenters who use the distinction find it necessary to note that the number of logical and objective associations given depends largely upon the character of the stimulus word; if it is abstract, logical associations are apt to predominate, if objective, the associations are largely objective. In an additional classification, presented in the following section, which aims to throw light upon the quality of the ideas expressed, the classes of percepts and concepts are fully recognized.

The classification I have adopted is similar to those of Wundt, Trautscholdt, Kraepelin, Bourdon, Aschaffenberg and Cattell, though it differs in some particulars from each of them. It divides all the associations into two groups:—the ideational in which the meaning of the word is the recalling agent and the sensorial in which the sound or appearance of the word or speech habit is the recalling factor. Both of these groups are subdivided into two groups, in the first of which the word as a concrete whole acts as the recalling factor and in the second of which some element or group of elements acts as a recalling factor. These are again subdivided, the ideational, group I, into contiguity and sentence form associations, group II into coördinations, subordinations, surordinations and judgments: the sensorial, group I, into speech habit and repetitions, group II into rhymes, assonances and alliterations.

CLASSIFICATION OF ASSOCIATIONS.

I. IDEATIONAL ASSOCIATIONS.

1.	Idea as a whole recalling agent.	Contiguity
		Sentence form
2.	Element of idea recalling agent.	Coördinate
		Subordinate
		Surordinate
		Judgment

II. SENSORIAL ASSOCIATIONS.

1.	Word as a whole recalling agent	Speech habit
		Repetition
2.	Element of word recalling agent	Rhyme
		Assonance
		Alliteration

The several subdivisions in the table may require a few words of explanation.

1. Contiguity associations include those in which the recalled idea has been previously experienced in association with the stimulus word.

2. Sentence form associations are such as exist between the words of a sentence when the thoughts are written out in sentence form.

3. Coördinations are those associations in which the recalled idea is similar to or in contrast with the stimulus word, as apple—peach; hope—despair.

4. Subordinate associations are those in which the recalled idea belongs to the same category as the recalling, but is subordinate to it, the order is from the general to the particular as novels—Ivanhoe; face—eye.

5. Surordinate associations are those in which the order of the ideas is from the particular to the general, as Ivanhoe—novels; eye—face.

6. Judgment associations are those involving a judgment.

7. Associations of speech habit or verbal contiguity occur between the words of habitual phrases, quotations, etc., not only those which the subject habitually says, but also those which he habitually thinks.

8. Repetitions are words used more than once in the list.

9. Rhymes are associations determined by the terminal sound of a word,

10. Alliterations are those associations in which the appearance of a word is the recalling factor.

11. Assonances are associations in which the sound of any part of a word is the recalling factor.

It frequently happens that several of these associative methods are involved in the recall of one word. As an example I shall cite a case, taken from a list written by a normal subject, in which alliteration combined with coördination appears to make up the recalling process. The subject had just written the word boots when a person present asked "Is that the letter-carrier?" (the letter-carrier always drives up in a little carriage and one was passing at the time), the next word written was buggy, and the following word also began with *b* and was in addition coördinate with buggy,—bicycle.

In correlating the material given by the forty-five subjects, I have grouped the individual results according to the clinical classification of the mental disease of the subjects. Fourteen are suffering from the excited form of manic depressive disease, five from the depressed form of the same disease. Nine are cases of dementia præcox, nine cases of secondary dementia, and two cases of senile dementia. Two are paranoiacs, two are cases of involutional melancholia, one is an example of psychasthenia (abulia and mysophobia) and one is diagnosed as a post febrile psychosis.

As the lists vary in length from 19 to 358 words I have reduced the number of associated words to the percentage of the whole number written, and the number of words in each class to the percentage of the total number of associated words, thus obtaining a fair basis for comparison and correlation. Some of the lists included in the groups are so short, nineteen and twenty-four words for instance, that one is inclined to think that the small number of words may be due to other causes and not to slowness and poverty of thought. This, however, does not appear to be the case. The subjects as a rule seem to pause only when ideas fail.

It is possible and indeed probable, that in some cases words

are suppressed which the subject considers as external in origin. In one case, a subject wrote for me three hundred and thirty words explaining that she "heard them," when asked to write what she thought herself, not what she heard, she wrote only forty-two. The short list was of course excluded from our results. Other subjects may have suppressed such words without my discovering the fact. In such cases the list would be no gauge of the rapidity of thought, and the train of ideas would frequently be interrupted as the hallucinatory voices usually participate conversationally in the dominant thoughts of the subject. If this has occurred it has caused an error in the tabulated results of the individual case, but would hardly have happened frequently enough to alter the group average materially.

It is also possible that the mere act of writing the words even without pause may impede the thought and render the lists valueless as a test of its *rapidity*. The experiments of Aschaffenberg (1) and Cattell (3) negative this idea. Aschaffenberg had a subject write in shorthand, and he found no increase in number of words. Prof. Cattell experimented on the train of ideas by giving one word and requiring the subject to write for twenty seconds. In comparing this method with that of naming the first associated word he says that "the number of the ideas was complicated by the need of writing them down, but the results seem to show that the number of ideas was limited, not by the rate of writing, but by the rate of thought." Miss Kellor (8), in experimenting with criminals, required them to write for one minute after applying a stimulus. For the negroes who were unable to write, the words were written down by the experimenter as the subject spoke them. This resulted in an increased rate for them in comparison with the white criminals who wrote with difficulty, but not in comparison with the student class. For the average educated individual it would seem that the number of words is limited by the rapidity of thought and not by the speed of writing.

If we at first treat our material as one large group, we are strikingly impressed by the great predominance of sensorial associations. (Table VIII, p. 45). The percentage of sensorial association is 45.6, which indicates that on the average 45.6% of the associations given depended merely on the sound or appearance of a

word or on habitual verbal contiguity—that is, on visual, auditory and kinæsthetic impressions. The average for alliteration, 19% was the highest of the subgroups of sensorial association, indicating that the visual elements of the stimulus were most active as recalling factors. Repetition follows with an average of 10%. It is interesting to note here that both Aschaffenberg and Sommer consider repetition a sign of pathological condition and state that it is not resorted to in conditions of normal fatigue.

Of the average 54.4% for ideational associations, 24% belong to the class of sentence form associations which is the most superficial form of ideational associations. This leaves only an average of 30.4% of associations in the groups of logical thought; of these 29% belong to the classes of contiguity and coördination, leaving only 1.4% to be divided between the three remaining classes which represent the more complex forms of thought.

If we arrange the classes of association in the order of per cent of associations given under each, starting with the class in which the largest percentage is given, we have the following succession—sentence form, alliteration, contiguity, coördination, repetition, speech habit, rhyme, assonance, surordination, subordination and judgment. If we group the individual subjects according to classes in which each gives the greatest per cent of associations, we find that sentence form associations predominate with 35% of the subjects, alliterations with 22%, contiguity associations with 15%, speech habit with 13%, coördinations with 9% and repetitions with 6%. The other classes take first place with none.

The dominant characteristic of the thought of the insane seems to be a very superficial association. Thought of this character lends itself so readily to an associative explanation that one does not wonder that Locke, the first to employ the term "association of ideas," invoked it to explain the aberrations of thought, and that Hume also, only found it necessary to assume such a process in the attempt to explain "mistakes of thought" and "sophisms".

Personal experience in experimenting with the patients brings the superficiality of their associations even more impressively before one than does an examination of the tables, as the superficiality is very pronounced in those patients who have not suffi-

cient application to conform to the requirements of the test. Many of the patients whom I examined either could not or would not write for fifteen minutes, but would write for two, five or ten minutes, and with these the tendency to alliteration and other sensorial associations was as a rule, very marked. A patient who was too suspicious to write for me or to comply with the requirements of any test, showed the tendency quite as clearly in her conversation. She was greatly confused and her consciousness would seize upon a letter of a word as a basis for her next thought. Noticing another patient who was mounting some steps, she said, "She goes up and I go down—up—down—u—d, you—damned, that is what it means—that is what it means, I am damned," and so on. It would seem that some single element of the impression rather than the impression as a whole acts as controlling agent, and that even that element acts in a most circumscribed manner, arousing so little mental activity that the word as a whole is not apperceived. Sounds and the appearance of letters, which by a normal individual would be entirely overlooked, owing to his greater interest in the idea suggested, now occupy the centre of attention. There is an apparent increase in the sensitivity to sense impressions, which is probably due to a depression of intellectual activity and a consequent turning of the attention to sensory impressions rather than to an increase in sensorial activity or impressionability. Such a depression of intellectual activity which leaves the field of consciousness clear for sensory impressions may account for a mental condition many times described by normal persons who have experienced some great mental shock. They report an unusually clear consciousness of the minute details of their surroundings, a consciousness so clear, that at the time they vaguely wonder how they can notice such trifles, while later the whole scene stands out in bold relief in their memories. The shock has for the moment blocked all power of voluntary thought and sensory impressions usurp the field of consciousness. Patients in whom such a condition persists are painfully aware of every sound in their vicinity. Many interpret these sounds most erroneously, frequently fitting them with words—a striking clock says to one patient, "What are you after, what are you after?" a creaking pair of

shoes to another, "I am taking it with me, taking it with me," etc. These words are externalized and localized with the noise heard, the patient believing that the words come from without as surely as does the tick or the squeak. The thoughts which these words represent are so entirely involuntary, so passive and beyond control, that their personal character is lost and a slight sensory stimulation is sufficient to establish an associative link by which they are externalized and their existence accounted for. This symptom of believing the thoughts to be in some way apart from the personality is a very common one. There seems to be a splitting off of part of the consciousness from the part which the patient considers as forming his own body of thought. The division is so complete, so absolute, that many such patients cannot be made to believe that they themselves are authors of these thoughts. I have had a patient say "They cannot be my thoughts, for they are so unlike anything I have ever thought."

Patients interpret the condition variously. Some think they hear the still small voice of God within them, some think that others are communicating with them by telepathy, or controlling their thoughts by hypnotism, while still others think that enemies are making use of their brain, their ideas, and dearly bought knowledge for their own purpose. A large number, as above stated, connect the words with sounds coming from the external environment, locating them wherever they are conscious of a sounding object, such as a clock or a bird, while others believe that they have the power of hearing through great distances or that the words are transmitted by telephone. Many believe that not only their thoughts and actions, but their emotions are controlled from without.

The one characteristic which unites all these states is the absolute belief of the patient that part of his thought is his own and part belongs to some other personality and is completely beyond his individual control. The patients are right, these thoughts are beyond their own control, they are beyond all control, for they are the direct and inevitable product of passive, superficial association, when entirely uncontrolled and uninhibited.

The conscious personality is the final product of a long process of blending and fusing of mental experiences. These experiences

live, not as entities, but only in the transformed character of the latest experience. Now if this highly complex mental structure is weakened by disease, the effect of this past experience is lessened or lost and new impressions are received blindly and passively and not, as by a normal individual, in the light of the past mental life. Words now call up others through their sensory qualities chiefly, ideational associations paling to insignificance. The patient, conscious of the difference in the character of his thoughts, and realizing also that they come quite without volition on his part, attributes them to some external source.

Such, it seems to me, is a plausible explanation of this very frequent phenomenon of the division of the mental life into a personal part and an impersonal. When the impersonal side of the consciousness takes the form of hallucinatory voices it seems probable that the thought habit of the individual is largely verbal with strong kinæsthetic and auditory elements, and that this tendency combined with complete passivity of association is sufficient to account for the externalization.

One very interesting case illustrates most clearly the relation between passive thought and the splitting off of a portion of the consciousness from the personality, and the further transition from this extrapersonal thought to externalization or true auditory hallucinations. The patient, before her mental breakdown, while she was still considered perfectly sane, became much interested in some psychic theories suggested to her by "The Law of Psychic Phenomena," by Hudson, "In Tune with the Infinite," by Trine, and some "New Thought" journals. These theories led her to think that perhaps by keeping her mind in a passive, receptive condition, she would be able to receive communications from others or from some higher source. She made the effort and succeeded. She grew so intensely interested in these thoughts, which she believed were sent her by God, that she became more and more absorbed in them to the exclusion of most else. She would be attracted by some beautiful object, would fall into a revery, and "be told" a story about it. Wonderful stories which she enjoyed greatly and felt were far beyond her power to create were "told her" in this way. She voluntarily suppressed all volitional control and encouraged the most passive thought;

the result was the same mental condition which accompanies loss of volitional control caused by pathological conditions.

One day she was told a pretty story about a Japanese parasol, which she had first been "ordered to buy." She was told in detail how it was made by a certain little Japanese lady; then finally that the little Japanese lady was present and would talk to her, whereupon she heard the little lady talking to her from the room. How intimate here is the relation between the internal extrapersonal speech and the auditory hallucination, how rapid the transition! The main difference between the internal and external voices seems to be one of localization.

Many normal individuals experience an analogous condition to that of the insane patient who hears articulate words in sounds. They unconsciously, when the mind is not actively occupied, set words to rhythmic sounds such as the "puff, puff" of an engine or the twitter of a bird. Several of our common birds and insects bear striking testimony to this tendency in the names which they constantly proclaim to all the initiated—the bobwhite, the whip-poor-will, and the katy-did. With the normal individual the tendency seldom reaches the point of hallucination, but there are many examples of the transition state when the patient feels that the words come from without, but reasons against it, knowing that this cannot be the case. The tendency in both the sane and insane is most noticeable when there is a great decrease of rational thought and the mind is chiefly alive to sensorial impressions of the moment.

A normal subject in talking over his list of associations remarked that when he could think of nothing more to write he used rhyme; when his mind was active and ideas teeming the sound of the word was lost on attention, but as soon as thought became barren the auditory quality acted as the recalling agent.

When the thought is rapid and unimpeded and at the same time undirected by any strong interest or goal idea we might expect to find superficial associations in large proportion. When the thought is labored and slow, and also barren of goal or motive, sensorial associations would again be expected. When, however, the mind is possessed by persistent ideas, sensory stimulation may become powerless to hold the attention and then we would

expect the number of sensorial associations to decrease and to be replaced by ideational associations and repetition.

The sensorial associations, apart from repetition, which is due to a persistence of impression and often to poverty and slowness of thought, may be grouped in three classes,—those in which the visual element acts as a recalling factor, (alliteration), those in which the auditory element acts as recalling factor, (rhyme, assonance) and those in which the kinæsthetic element, probably in combination with the other two, acts as recalling agent, (speech habit). It seems possible that the preponderance of any one of these classes in an individual's list may indicate his sensory type.

When there is a more thorough apperception of the word, when the past mental experience of the individual meets, clarifies and enriches the incoming idea, the various forms of ideational association result—sentence form, contiguity, coördination, subordination, surordination and judgment occuring in the order named as the apperceptive activity is more closely focussed on special aspects of the idea. Thus we find that in both ideational and sensorial associations the ideas are suggested sometimes by the stimulus word as a whole and sometimes by its elements. For instance the word clock acting through its sound element might call forth the word block, acting as a whole through speech habit it might recall (clock) maker; acting through an element of the idea presented—time, it might suggest life or eternity, and acting as a whole, it might, through contiguity, suggest City Hall. Speech habit, sentence form and contiguity associations result when the idea acts as a concrete whole; coördinations, subordinations, surordinations and judgments, rhymes, assonances and alliterations when it acts through its elements.

Thus we find that an idea often acts through its elements in the most superficial as well as in the most abstract thought, the difference being that in abstract thought the element is abstract, conceptual in character, and can only be derived from an apperception of the meaning of the word, while in the sensorial thought the element is purely sensorial. Thus the characteristic of the association of elements of ideas, rather than of concrete ideas, is not peculiar to the penetrative and creative activities of the intellect as is suggested by Miss Calkins, but is also typical of the most superficial thought connections.

INDIVIDUAL RESULTS—GROUPED CLINICALLY

The accompanying tables (I–VIII) present the results for individuals and also the average results for each clinical group.

Of the nineteen manic depressive cases examined, fourteen were in the excited and five in the depressed state.

MANIC DEPRESSIVE INSANITY—EXCITED (TABLE I)

The number of words written by the fourteen subjects of the first group is 2389 and the average 171, m.v. 80, median 157. Of these 2147 or an average of 153 are associations. The average per cent of associations is 86, the remaining words, 14%, being suggested by the environment or some unrelated memory. Of the total number of associations (86%) 69% are ideational and 31% superficial; 45% of the 69% however are sentence form associations, the most superficial of all ideational associations, and this leaves only 24% to be divided among the remaining ideational classes. The classes of coördination, subordination and surordination, and judgment are poorly represented, none of them amounting to as much as 1% with the exception of coördination which numbers 9%; the balance of 14% is made up of contiguity associations.

Thus we see that the forms of association are pre-eminently superficial, rarely reaching logical thought. The most distinctive feature of these cases as a class is the very large per cent of sentence form associations (45%). In individual cases it often rises much higher than the group average, in seven subjects exceeding 60% and in one amounting to 94%. Of the fourteen subjects seven gave the largest per cent in sentence form associations, three in contiguity associations, three in the speech habit class, and one in alliteration.

MANIC DEPRESSIVE INSANITY—DEPRESSED (TABLE II)

The number of words written by the five subjects in the second group—the depressed state of manic depressive disease,—is 417, the average is 83, m.v. 74.4, median 31. Comparing these numbers with those given by the first group we find a falling off of 88 words n the average and 126 words in the median. The number of

associations is 291, average 58. The average per cent of associations is 52; again comparing we find that this is 34% less than the average per cent given by the first group. There is evidently less activity of thought and also less continuity of thought, the train is often interrupted by sensory impressions or unrelated ideas. The average per cent of ideational associations is 40 and of superficial associations 60, which nearly reverses the figures given by the first group. This is largely due to the entire omission of sentence form association by three of the subjects and the small proportion given by the other two. There are no associations in the classes of subordination, surordination, or judgment, a large proportion, 29%, are contiguity associations, 7% are coördinations, and 4% sentence form associations.

The most striking feature of this group is the large per cent (34) of alliterations. The associations of the depressed group are still more superficial than are those of the excited group, being conspicuously sensory in character: two subjects gave their largest per cent in the class of alliteration, one in the class of contiguity associations and one in repetition, while the fifth gave her largest per cent in both the alliteration and contiguity classes, the number of words in these two classes being equal.

A comparative study of the results of these two groups shows that in the depressed cases there is a reduction of the rapidity of thought (av. 171 words written by first group,—av. 83 by second); a reduction in associative activity (av. 86% associated by first group,—av. 52% by second); and a depreciation in the quality of the associations, that is a greater dependence on sensorial impressions for stimulus than upon ideational ones.

The first group is remarkable for its large per cent of sentence form associations (45), and the second for its large per cent. of alliterations (34), both for the preponderance of superficial associations.

DEMENTIA PRÆCOX. (TABLE III.)

The nine subjects in the dementia præcox group give a total of 1197 words, average 133, m. v. 73, median 112. The number of associations is 1046, average 116, while the per cent of associations

is 83. Of the whole number of associations 44% were ideational and 56% sensorial; 24% of the 44% belong to the sentence form class, so that only 20% is left for the more complex ideational associations; 13% of these are coördinations, 5% contiguity associations and 0.9% surordinations. The largest per cent in the sensorial group is given in the class speech habit 20%, repetition follows closely with 19% and alliteration comes next with 13%. In rapidity of thought, this group stands midway between the two manic depressive groups—in associative activity it equals the excited group of manic depressive disease. Its per cent of sensorial associations (56) nearly reaches that given by the depressed group and it has quite a large per cent of sentence form associations (24.4). The group is remarkable for the entire absence of subordinations and judgments and for the low percentage of contiguity associations (5). Of the nine subjects four gave the greatest per cent of associations in the sentence form and two in the speech habit class; in one list alliteration predominated, in one repetition, and in one coördination.

SECONDARY DEMENTIA. (TABLE IV.)

In the group of secondary dementia there are also nine cases. The total number of words written is 927, average 103, m. v. 60, median 86. The number of associations is 754, average 84. The average per cent of associations is 70. The average number of words written, the average number of associations, and the average per cent of associations thus fall below the averages given by the dementia præcox group and the excited group of manic depressive insanity, but do not reach the low mark of the depressed group of manic depressives. The average per cent of ideational associations is 60 and of these 46% fall under the head of sentence form associations. Thus only 14% represent the more complex thought; of these 11% are contiguity associations and 2% are coördinations. There were no subordinate associations and no judgments. These results resemble much those given by the manic depressive class, excited group, namely 69% ideational associations, 45% of which are in the sentence form class. Forty per cent are sensorial associations, of these 19% are alliterations, 7% rhymes, 7% are due to speech habit, 6% to repetition and 2% are assonances.

Forty-six per cent of associations in sentence form and 19% alliterations are the most impressive features of this group, and we notice that it combines the distinctive feature of the excited group of manic depressive cases with the distinctive feature of the depressed group. Five individuals gave their largest per cent of associations under sentence form, three under alliterations, and one under speech habit.

The remaining eight cases (table V) must be treated individually, as groups would be too small to be of any value.

Two of these are cases of involutional melancholia. The number of words written was low, 70 and 34, the number of associations very low, 7 and 8, the per cent of associations also low, 10 and 23. The per cent of ideational associations, however, is larger, in one case 100% and in the other 62%; they are divided between contiguity associations and coördinations; there are no sentence form associations. Of the 38% sensorial associations of one subject 25% are alliterations and 13% repetitions. These results indicate that mental action is very slow and the association process very sluggish, but also that the few associations which do occur are apt to be ideational in character and less superficial than those of any group we have examined.

Two cases of senile dementia are totally unlike in character. One wrote 60 words, 29 of which, or 48% are associations. Of these 87% are ideational associations, chiefly divided between the classes of contiguity and coördination; 13% are alliterations. The other patient wrote 203 words, 99% of which were associations; 94% of these were repetitions, 3% were sentence form and 2% alliterations.

We have two lists from paranoiacs. These are also quite dissimilar. One wrote 73 words of which 43% were associations; 91% of these are sensorial in character, 69% being alliterations, 13% assonances and 9% repetitions. The remaining 9% were coördinations. It is interesting to note that a second list obtained from this patient after six months' interval gave similar results. Another paranoiac whom I could not induce to write for longer than five minutes, wrote a list of similar character. They both chose complicated words, but the actual associative links were purely sensorial. The other paranoiac wrote 104 words of which

64% are associations; 77% of these are ideational in character, 3% contiguity, 73% coördinations, and 1% subordinations, while 22% are sensorial; 20% alliterations, 1% rhymes, and 1% repetitions.

One patient, whose condition is a chronic one of mental torpor, following an attack of typhoid fever, wrote 234 words, 208 of which or 89% are associations. Of these 30% are ideational associations, 20% contiguity and 10% coördinations; and 69% are sensorial, 59% alliteration, 4% repetition, 3% speech habit, and 3% rhyme. The predominance of sensorial associations is quite typical in this case. The patient is during the greater part of the time in a state of torpor. She herself describes her condition as being asleep, and asks that we come and talk to her in order to arouse her. She says that she forgets to think, even forgets that she does forget. When her thought is stimulated, as by the effort to write this list of words, it is naturally not rich in content, and the sound and appearance of the words act immediately as recalling agents, without the meaning of the words fusing with any previously experienced ideas.

The psychasthenic furnishes us with a list differing in character from all the others. She wrote 90 words, 86 of which or 96% are associations. 91% of the associations are ideational, of these 67% are coördinations, 12% subordinations, 9% surordinations and 3% contiguity associations. Of the 8% of sensorial associations 6% are alliterations and 2% rhymes. The list is remarkable for its high per cent of ideational associations and also for containing the largest per cent of surordinations and subordinations given by any patient. There is more complex thought expressed than in any other list.

Finally we present a table (table VI) showing in which class of associations the individuals of each group gave their largest percentage. This table shows, as do also the percentage tables, that sentence form is most likely to occur in cases of manic depressive insanity (excited stage) of dementia præcox, and of secondary dementia; that alliterations are probable in cases of manic depressive insanity (depressed stage), of dementia præcox, of secondary dementia and of paranoia.

It shows also that the typical characteristic of a group is not

predominant in the list of every individual of that group; this is to be expected, as a group is not characterized by its largest class of associations alone but by several prominent ones. For instance the excited group of manic depressive disease is distinguished, not by sentence form associations alone, but also by speech habit and contiguity associations; the depressed group of the same disease not by alliterations alone, but also by contiguity associations and repetition; dementia præcox, not by sentence form and speech habit only, but in addition by repetition, alliteration and coordination; secondary dementia not by sentence form alone, but by alliteration and contiguity as well. Therefore there is quite a latitude for individual variation within the dominant characteristics of any given group.

RESULTS OBTAINED FROM NORMAL INDIVIDUALS.

With the object of finding out if possible whether the presence of so large a proportion of superficial associations was distinctly an abnormal characteristic, I obtained similar lists of words from ten normal women. One is a physician, one a laboratory assistant, two are teachers, one is a stenographer, one a school girl fourteen years of age and four are nurses. These women are, like the patients with whom they are compared, of varying age, type, occupation and experience.

Compared with the former study the results (tables VII and VIII) present striking evidence of a contrasting condition of mentality. We notice first that there is a greater activity and rapidity of thought coupled with greater concentration. The average number of words written is 212, with the insane subjects it is 120, the average number of associated words is 186, with the insane it is 98, and the average per cent of associated words is 86.8%, while with the insane it is 70%.

This greater activity of thought and larger per cent of associations were to be expected but the most striking result is the contrast in the number of ideational and sensorial associations. The normal subjects give an average of 86.3% of ideational associations and only 14% of sensorial associations while the insane subjects give, it will be remembered, 54% of ideational and 46% of sensorial associations.

Examining the sub-classes we find, moreover, that the normal subjects give only 4.9% of sentence form associations while the insane subjects give 24%. If we deduct from the ideational total of each group the number of sentence form associations, which comprise the most superficial associations of the ideational group, we find a still greater contrast, 81% and 30%. Thus the 86% is largely representative of the deeper kind of thought connection; 51.9% are contiguity associations, 16.4% are coördinations, 5.7% are subordinations and 5.7% judgment associations.

In the sensorial group, speech habit leads with 6.4%, alliteration follows with 4.9%, then comes rhyme with 1%, assonance with 0.62% and repetition with 0.3%. The order of the sensorial associations with the insane was alliteration, repetition, speech habit, rhyme and assonance. Rhymes we find almost absent in the lists written by sane subjects and are reminded again of Aschaffenberg's and Sommer's opinion that rhyming is a pathological symptom.

Contiguity associations are very numerous and show how large a part the pure memory of past experience plays in the thought of most of us. The number of associations in this class is more than three times as great as the number in the corresponding class for the insane subjects, and in nine of the normal lists the number of contiguity associations surpasses the number in any other class. (Table VI). We note also that the class of subordination is fourteen times as great in normal subjects as the class of surordination. This agrees with Cattell's results in which subordinations are more frequent than surordinations.

The most striking result of the comparison is the vastly greater number of ideational associations given by the sane subjects and the correspondingly smaller number of sensorial associations.

It would seem that there are two agents which determine the succession of thought—one the sensorial impression of the moment and one the attendant apperceptive mass. When the first agent is all powerful the result is a sensorial association, when the power of the second predominates an ideational association results. In the insane this apperceptive mass (by which is meant not the memory of, but the mental result of previous mental experience,—the intellectual acumen of the individual), is in-

active. With a sane individual each impression is made upon an already active mentality, which greatly modifies the impressions, sometimes completely transforming them, and determines in large part what the next idea shall be.

With a sane subject an impression often calls up a large number of associations, a succession of words is frequently written all of which refer to the first impression, or the first association written leads to a series of words after which the thought reverts to the first idea and follows out a different trend. But the ideas presented are all powerful; rhyme, alliteration, assonance, etc. are barred out by the sheer activity of the intellect. With large numbers of the insane on the contrary the mental activity is entirely unguided and is at the mercy of every chance impression, the associations are involuntary, passive and free. We find no abnormality in the passive associative processes, they on the contrary, act most readily and smoothly. The abnormality lies in the inability to guide the thought, in an absence of true mental perspective, which results in the sane from the apperceptive activity.

Thus the distinction taken as the basis of our classification, the distinction between active apperceptive thought and a passive associative connection proves also to be the chief distinction between the mentality of the sane and the insane.

Finally we shall compare the averages given by the normal group with those given by the several insane groups, (table VIII). Comparing with the excited group of manic depressive cases we find that in the latter group the percentage of ideational associations is much smaller (86.3-69) while the percentage of sensorial associations is correspondingly larger (14-31). The greatest difference lies in the groups of sentence form and contiguity associations. The number of sentence form associations greatly exceeds the number given by the normal group (45%-4.9%) while the contiguity associations are much fewer in number (14%-51.9%). Coördinations occur nearly twice as often in the normal group, subordinations and judgments are also much more numerous while surordinations are only slightly more frequent.

Next examining the depressed group of manic depressives we

find that the per cent of ideational associations is less than one-half as great as that of the normal group (40%-86.3%) and the per cent of sensorial associations more than four times as large (60%-14%). In the sub-classes the greatest contrasts lie in the class of alliterations (34%-4.9%) in the class of rhymes (9%-1%) and in repetition (11%-0.35%). On the ideational side we find the sentence form associations about normal in number (4%-4.9%), the coördinations somewhat below (7%-16.4%), and the contiguity associations still more below the normal (29%-51.9%). The subordinations, surordinations and judgments are entirely lacking in this group.

In the dementia præcox group we have again about half as many ideational associations and four times as many sensorial associations (44% and 56%-86% and 14%) as is given by the normal group. Again the sentence form group is much larger (24%-4.9%), while the contiguity associations are fewer in num ber (5%-51.9%). The coördinations and surordinations are of about normal frequency while judgments and subordinations are absent. The proportion of speech habit associations is very large (20%-6%), also the proportion of repetitions (19%-0.3%), while the alliterations follow closely (13%-4.9%).

Comparing the group of secondary dementia cases with the normal group we find a decrease in the per cent of ideational associations (86%-60%) and an increase in the per cent of sensorial associations (14%-40%). The greatest variations are again found in the sentence form and alliteration associations. The sentence form group numbers 46% in contrast to 4.9%, and the group of alliterations 19% in contrast to 4.9%. There is an increase of rhymes and repetitions, a decrease of coördinations and an absence of subordinations and judgments.

One case of melancholia gives a larger per cent of ideational associations than that of the normal group (100%-86.3%). (Table V.) This excess is due entirely to the great number of contiguity associations (85%-51.9%). The proportion of coördinations is about normal and all other forms of association are lacking. The second case of melancholia gives fewer ideational associations than the normal group (62%-86.3%). The 62% is made up entirely of coördinations. Of sensorial associations, the number of allitera-

tions is excessive (25%- 4.9%) as is also the number of repetitions (13%-0.35%). All other classes of association are omitted.

Of the two cases of senile dementia one gives the normal number of ideational associations, 87%. All judgments, sentence form associations, and surordinations are missing, the remaining sub-classes are represented about normally. The only marked abnormality is an excess of alliterations (13%-4.9%). No other forms of sensorial associations were used.

The other case of senile dementia only gives 3% of ideational associations as contrasted to the 86. 3% of the normal group. The 3% is moreover made up entirly of sentence form associations. The list is remarkable only for the great preponderance of repetitions 94%, the normal precentage falling short of 1.

One paranoiac gives but 9% of ideational associations (9%-86.3%), a percentage less than that of the normal percentage for coördinations alone, to which class the whole 9% belong (9%-16.4%). The peculiarity in this list is an immense number of alliterations (69%-4.9%) there is in addition an excess of assonances (13%-0.6%) and of repetitions (9%-0.35%). The other paranoiac gives 10% less ideational associations than the normal group (77%-86.3%). Among these are a larger number of coördinations (73%-16.4%), contiguity associations are very scarce (3%-51.9%), alliterations are frequent, (20%-4.9%).

The post febrile case also shows a poverty of ideational associations (30%-86.3%) and a great excess of alliterations (59%-4.9%).

The case of psychasthenia on the contrary gives a slight excess of ideational associations (91%-86.3%) the contiguity class being very small (3%-51.9%) and the coördination class large (67%-16.4%) while the proportion of surordinations is greater than that of the normal group (9%-0.4%) or of any normal individual.

Thought Content

After analyzing the lists of words from the view point of their succession, I reviewed them with the object of ascertaining their significance irrespective of associative connection. This entailed a second classification.

Eight main groups were formed,—the first including words

suggested by the immediate surroundings, the second words relating to subjects of study, the third words relating to personal experience, the fourth words relating to the general world environment, the fifth names of objects thought of, the sixth concepts, the seventh proper names and the eighth parts of speech. In this last group are placed all words that cannot be subsumed under any of the other headings, such words as frequently occur when the thought is expressed quite fully as in speech habit or sentence form associations. These eight groups are more minutely subdivided, the first into various kinds of percepts,—general surrounding, experiment, etc., the second into a long list of subjects, the third into experience and reflection, the concept group into literature, science, art, emotion, etc., and the other groups into quite detailed sub-classes.

In this classification the distinction between conceptual and objective thought, which the classification of associations omitted, is recognized, and, in addition, the individual trend of thought is indicated by the proportion of words assigned to the several sub-classes.

We would expect students to give large percentages in the classes of concepts and subjects of study, and active workers in the world to swell the classes of world environment. Personal experience would probably play a large part in most lists as would also names of objects.

I find that the lists vary in their value as indices to the mental content. Those of the insane are as a rule of great value in this respect. We have seen how predominant sentence form associations are, and these are usually reflections of the subject's dominant thoughts—delusions are very apt to find expression in this form. From all the lists of the sane which I have examined (excepting that of one man, which does not appear in this investigation) I would be able to infer not only the general trend of thought of the writer but the occupation as well.

The number of words given by each subject is reduced to the per cent of the total number of words in the list, and the individual results grouped according to diagnosis as in the previous classification. Separate tables for each group of subjects and one summing up the results of the insane and comparing them with those of the sane follow (tables IX-XV.)

Table XV shows that the most striking characteristic of the lists of the insane is the very large per cent given in the class of parts of speech. These words of course have very little thought content, being for the most part words used to connect the more essential ones in a sentence. The excited group of manic depressives gives 45%, the depressed group of the same disease 30%, the dementia præcox group 37%, and the secondary dementia group 38%. Of the eight cases which are not grouped (table XIII), one, a case of senile dementia, gives 95%; one, a paranoiac, gives 38%; one, the post febrile case, gives 20%; and of the others, three cases give no words in this class and two cases but 1%. The average for the total number of insane subjects is 34%, which greatly exceeds the proportion given by the normal group (9%).

The next fact which impresses one is the large number of proper names given by the insane—the excited group of manic depressive disease 13%, the depressed group 5%, the dementia præcox group 33%, the secondary dementia group 15%, the case of psychasthenia (table XIII) 35%, the average of all 14%, while the average for the normal group is but 7%, (table XV). Our subgroups reveal the fact that the proper names written by the insane are frequently the writers' own names.

Of concepts we find the smallest per cent in the excited group of manic depressive disease (8%) and the largest, strange to say, in the dementia præcox group (21%), while the average is slightly higher than with the normal group (16%-14%).

The per cent of objects thought of is nearly three times as great with the sane as with the insane (34%-13%). In the insane groups it drops to its lowest with the dementia præcox cases, 4%, and reaches its maximum with the depressed manic depressive cases, 17%. One paranoiac gives 62%, and the psychasthenic 42%. (Table XIII.)

The world environment class is small throughout, amounting to but 2% with the insane and 4% with the normal subjects.

The personal experience class is also small with the insane, never surpassing 5% and averaging only 2%. The average with the sane subjects is 14%.

In the class of subjects of study the normal group gives 5% while the insane group reaches only 0.1%.

The insane with the exception of the dementia præcox group (7%) draw largely on their immediate surroundings for their ideas. The average per cent of words given in this class is 19, which exceeds the average of the normal group, (13%).

Summing up, we find from our tables that in the lists of the insane the proportion of words which can be classified only as parts of speech is nearly four times as great as in the normal group; that the percentages exceed those of the normal group in the classes of immediate environment and proper names, and slightly in that of concepts.

The subgroups are of great value in the study of the individual cases, but contribute nothing to the study of group results. For instance if a certain group of patients gives 20% concepts it indicates a certain quality of thought; whether these concepts relate to literature or science makes no difference. But whether they relate to literature or science is of great importance in the study of an individual patient in which case the object is to gain as great an insight as possible into the subject's mind and to trace the origin of delusions, fixed ideas, etc. The following cases will illustrate the value of the subgroups:—Case 8, in the excited group of manic depressive disease (table IX) gives 21% concepts, an examination of the subgroups (which are not presented in the table) shows that nearly one half of these are representative of religious thought. In the same list we find 3% of the words are proper names, and from the subgroups discover that they are largely the writer's own name. From these results we would judge that the patient had religious and egoistic tendencies. In another list written when the patient was in a greatly improved condition there are 18% concepts, half of which are religious in character, and 9% proper names of which only a fraction of 1% are the subject's own. The religious tendency had not abated but the egoism evidently had. In a list written by case 11 of the same group we find 13% of the words are suggested by the immediate environment. On further examination we discover that over three-fourths of these are visual percepts. In the list of a dementia præcox patient (case 21, table XI) 2% of the words have been placed in the class of immediate environment, all of these are auditory percepts; 25% are concepts, of these three-

fourths are referable to literature. Case 38 (table XIII) a melancholiac gave 90% in the class immediate environment, all but one word of which represent visual percepts. Case 6 (table IX) an excited manic depressive subject wrote 10% concepts, of which nearly one-half relate to music, which was her profession. Case 42 (table XIII) a paranoic, gave 45% concepts, 88% of which are qualities. From the list written by normal subjects (table XIV) I would cite that 10% of the physician's words relate to subjects of study and one-half of these to physiology and hygiene, (subject I). One teacher draws 28% of her words from subjects of study nearly all of the words relating to subjects which she taught, (subject 3). Another teacher gives 59% concepts of which 76% refer to literature (subject 5). Subject 7, a nurse ,gives 27% proper names all of which are of places. Subject 9, another nurse, draws 13% of her words from the immediate environment, one-third of these represent visual and one-third auditory percepts; she also gives 15% concepts, 62% of which are qualities. One readily sees from these examples how important the subgroups are in an examination of individual cases. The results of the subgroups are not presented in tabulated form. To be of interest each list must be treated as a separate theme and receive exhaustive study.

Rapidity of Thought.

We judge of the rapidity of thought by the number of words written in fifteen minutes.

In some cases where subjects intentionally reject certain thoughts the number of words is not a fair index of speed. One patient, for instance, wrote for me 330 words when listening to hallucinatory voices and chronicling what they said, and only 42 when she rejected what she heard and wrote her own thoughts alone. She was perfectly frank in her explanation, but suspicious patients suffering from hallucinations might also studiously avoid writing the hallucinatory words and feign poverty of thought. In the case above cited the shorter list was of course rejected. Though I think it improbable that any of the subjects whose lists I included purposely repressed words, we have to take into consideration the possibility of their so doing when considering the

value of the numerical results. I feel justified in believing that such rejections were not numerous enough to affect materially the group averages, though of course it is possible that some individual lists may not be reliable.

This repressing of the hallucinated words affects the train of the associations as well as the number of words written. The hallucinations are, as a rule, associated with the personal thought of the patient, they form the nucleus of the thought which plays around them, both parts contributing to one train of thought, though one part is externalized and one is not.

The average number of words written by the forty-five insane subjects (table VIII) is 120 the longest list numbering 358 words, was that of an excited case of manic depressive disease, (case 1, table I,) the shortest list 19 words, that of a depressed case of the same disease (case 16, table II). The average number written by the 10 normal subjects (table XIV) is 212 words, the longest list numbers 301 words (subject 1, table XIV), the shortest 128 (subject 8, table XIV). The insane reach greater extremes at both limits and their average falls below the normal group by 92 words or 43%.

The excited group of the manic depressive cases gives the highest group average, 171 words, as well as contributing the longest individual list. The depressed group of the same disease gives the lowest group average, 83 words, and also the shortest individual list, (table VIII). The average number written by the dementia præcox cases stands second and that written by the secondary dementia group next, (table VIII).

Table XVI shows the approximate length of the individual lists in the different groups. By it we see that only nine lists numbered less than 50 words, and that they represent the groups of manic depressive disease, dementia præcox, secondary dementia and melancholia. Fourteen lists numbered between 50 and 100 words and represent all the groups studied. Eleven lists contain between 100 and 200 words, ten between 200 and 300 words, and one 358 words. The lists numbering over 100 words represent cases of manic depressive disease, dementia præcox, secondary dementia, paranoia and post febrile psychosis. Of the normal subjects five wrote between 100 and 200, four between 200 and 300 words, and one wrote 301 words.

Practice and Fatigue.

The effect of practice and fatigue is shown by the relative number of words written in the first, second and third five minute periods.

The fatigue thus indicated is not a motor fatigue due to the exertion of writing; for those who write the most rapidly and whose hands are the most cramped and tired when they finish are the very subjects who steadily increase in speed. The fatigue is a mental one, the mind seems to lose its alertness and ideas follow each other more slowly. The increase in speed may be due to a growing ease in complying with the requirements of the experiment, or to an increase in ideational activity due to continuous mental application.

The results are tabulated by two different methods and presented in tables XVII and XVIII. The first table (XVII) presents the number of cases in each group which shows a continuous increase or a continous decrease, an increase followed by a decrease, a decrease followed by an increase, equal speed throughout or an equality in the first and second or second and third periods. The table indicates that in the excited stage of manic depressive disease fatigue shows itself but is overcome in the last period by practice. Four subjects wrote with an even speed throughout, two were manic depressive cases (excited) and two cases of dementia præcox. Eight showed a steady decrease due probably to increasing fatigue; six a steady increase due probably to practice; six show an increase then a decrease, the effect of practice appearing earlier than that of fatigue; thirteen a decrease and then an increase, an early fatigue being overcome by practice.

Nothing particularly distinctive of any of the groups is brought out by these results excepting a final increase in speed in a majority of the excited cases of manic depressive disease, (ten). only one case in this group shows a continuous decrease and one a decrease after an increase; two show equal speed throughout.

Of the normal subjects three show first a decrease then an increase in speed, and two a continuous increase, thus half (five) show a *final* increase in speed. This proportion is quite similar to that shown by the total insane group, twenty-two of the forty-five subjects showing the same final increase.

The second table (XVIII) gives the number of cases in each group that wrote the greatest number of words in the first, second or third five minute period. Nineteen of the insane subjects wrote more rapidly in the first five minutes, thirteen in the last five minutes, six in the second five minutes. Three wrote more rapidly in the first and second periods, two in the second and third, and two wrote at the same rate throughout. The table indicates that with the majority of these subjects the effect of fatigue is greater than that of practice. The excited manic depressive group is the only one in which one-half the cases wrote the greatest number of words in the last period.

In the first table the final increase means an increase over the second period, not necessarily over the first; thus some of the twenty-two cases in that group, in our second table are numbered with the group writing most rapidly during the first period. This explains why while we have twenty-two subjects showing a final increase, we only have fifteen writing most rapidly in the last period. Of the normal subjects four wrote most rapidly during the first period, one during the first and second periods, four during the last period and one during the second period.

The value of this test for fatigue and practice is greater for individual diagnosis than for group results.

Concentration of Thought.

The degree of concentration of thought is indicated by the length of unbroken trains of associations. These vary from 4 to 197 words. Table XIX shows the number of patients in each group whose longest train numbers less than 10 words, between 10 and 25 words, between 25 and 50 words, between 50 and 100 words, or over 100 words.

Two dementia præcox cases, three manic depressive cases (excited) and one case of senile dementia wrote trains of over 100 related words. The length of the senile list is accounted for by repetition, the length of the manic depressive lists by sentence form associations and the length of the dementia præcox list by speech habit, repetition and alliteration. Neither subject suffering from involutional melancholia wrote more than 10 consecutive as-

sociated words and but one of the depressed group of manic depressives wrote as many as 19. The subjects affected with dementia præcox and with manic depressive disease in the excited stage tend to write long lists of associated words. The depressed cases of manic depressive disease and cases of melancholia on the contrary tend to write short ones. These are the only distinctive group results. Considering the results as one large group we find twelve subjects writing 10 words or less as the longest connected train, nine subjects writing between 10 and 25, ten subjects between 25 and 50, eight between 50 and 100 and six over 100.

Of the normal subjects, six individuals wrote between 25 and 50 words in their longest associated train of words, three between 50 and 100, and one wrote more than 100 words (137). None wrote under 25, while the longest trains of twenty-one of the insane subjects numbered less than 25 words each.

Another indication of the amount of concentration is the number of times the train of thought is changed during the 15 minutes. The greater the number of changes the greater the distractability of thought, the more open the mind to any chance stimulus. These numbers are only of value, however, in relation to the total number of words written, so we present in tabulated form (tables I, II, III, IV, V, VI, VII), the per cent of words which are associated with others and those which are not. The latter number indicates the proportionate number of times the train of thought is changed.

Table VIII shows that the average per cent of words written without any apparent associative suggestion is 30. The largest average given by any group is that given by the depressed cases of manic depressive insanity (48%), and the lowest by the excited cases of the same disease (14%). The lowest per cent for an individual list is 1; it occurs in three cases of dementia præcox (table III, cases 20, 22, 27) and in a case of manic depressive disease (excited) (table 1, case 4). The highest is 90 occurring in the list of a melancholiac (table V, case 38.)

Thus both methods of arranging our results lead to the same conclusion, that we find the greatest amount of concentration of attention in excited cases of manic depressive insanity and in dementia præcox and the lowest degree in the depressed cases of manic depressive disease and melancholia.

In the normal group the lowest per cent of unassociated words is 4, the highest 22, the average 13.2 (table VII). The normal average is thus 17% less than the average for the insane patients which is 30%, and indicates a much greater amount of concentration.

Power of Application.

The power of continued application to any task is often very low with insane subjects, and this inability is shown while trying to comply with the requirements of the association test, by pauses in which the subject's mind wanders entirely away from his occupation. This in some cases makes it impossible to secure a list, in others the experimenter can so urge the subject on that not much time is lost, not more than can be made up. This condition existed in one of the dementia subjects who gave 99% of associated words. She would stop writing, talk a little about something entirely irrelevant, then return to her list and pick up her thought just where she left it. She wrote the full fifteen minutes but they were not consecutive. This was the only subject who thus combined the two diverse characteristics of concentration and lack of application, and strange to say, she exhibited them both in greater degree than any other subject, the associative connection was not only never broken but 74% of the associations were coördinations—they were names of diseases. This is the only subject whose list is included who showed such marked lack of application. All the others who showed it to any great degree were entirely incapable of completing the task, but the uncompleted tests served to throw much light on their condition. With many of the patients, although the test failed in its primary object, it served to bring out individual peculiarities in a clear and forcible manner. The effort to concentrate produced in many cases marked hallucinations, in others it led to a betrayal of their delusions, while in still others the mere request to write was enough to disclose a great mine of distrust and suspicion. Thus both directly and indirectly the test has proved a most useful one.

Its direct results lead to the following conclusions:—

1. All associations may be grouped in two fundamentally distinct classes—ideational and sensorial.

2. The associations of the insane are predominantly sensorial.

3. The thought of the excited group of manic depressive disease is characterized primarily by sentence form associations; contiguity and speech habit associations are also frequent.

4. The thought of the depressed group of manic depressive disease is characterized by alliteration, repetition and contiguity associations.

5. The thought of the dementia præcox group is characterized chiefly by speech habit and sentence form associations. Repetitions, alliterations and coördinations are also frequent.

6. The thought of the secondary dementia group is characterized by sentence form and contiguity associations and alliterations.

7. Compared with the normal subjects the insane used in their lists more words suggested by the environment, more proper names and about four times as many words having in themselves little thought content, *i.e.* conjunctions, prepositions, etc.; they used far fewer words relating to objects of past experience and about an equal number of concepts.

8. The rapidity of thought as indicated by the number of written words is much greater with the normal than with the insane subjects—average 212 as compared with 120. The mean variation is much less with the normal subjects.

9. The effect of practice is most noticeable with the excited group of manic depressive disease—the rate of speed increasing in the last period with ten of the fourteen subjects.

10. The power of concentration among the insane is greatest in the excited group of manic depressive disease, in which it nearly equals the average of the normal group; it is lowest in the depressed group of manic depressive disease and in melancholia.

TABLE I.

PER CENT OF ASSOCIATIONS IN EACH CLASS

Manic Depressive Insanity (Excited) CASE	Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
1	7	84	2	0	0	0	93	0	4	0	3	0	7	358	329	92	8
2	6	24	17	0	0	0	47	29	24	0	0	0	53	77	17	22	78
3	17	61	0	0	0	0	78	14	5	0	2	0	21	94	84	89	11
4	0	94	0	0	0	0	94	6	0	0	0	0	6	135	134	99	1
5	34	13	30	0	2	0	79	8	1	2	8	1	20	241	207	86	14
6	13	3	11	2	0	0	29	53	4	1	12	0.4	70	259	244	90	10
7	2	91	2	0	0	0	95	5	0	0	0	0	5	228	223	98	2
8	5	77	0.7	0	0	0	83	4	10	2	1	0	17	288	274	95	5
9	26	0.6	22	3	0.6	3	55	2	2	16	22	4	46	179	158	88	12
10	32	5	15	0	0	0	52	3	3	5	34	2	47	73	59	81	19
11	1	87	1	0	0	0	89	4	3	1	3	0	11	202	177	88	12
12	16	24	4	2	0	2	48	29	12	0	10	2	53	116	111	95	5
13	1	68	0	0	0	0	69	0	1	25	5	0	31	99	95	96	4
14	40	0	20	0	0	0	60	34	0	0	6	0	40	40	35	87	13
Average	14	45	9	.35	.18	.35	69	14	5	4	7	.5	31	171	153	86	14
														M. V. 80	77	10	
														Med. 157	146	90	

TABLE II.

PER CENT OF ASSOCIATIONS IN EACH CLASS.

Manic Depressive Insanity (Depressed))	Case	Contiguity	Sentence Form	Coördination	Subordination	Superordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
	15	25	0	25	0	0	0	50	0	0	0	50	0	50	31	4	13	87
	16	67	0	0	0	0	0	67	0	0	0	33	0	33	19	9	47	53
	17	29	14	7	0	0	0	50	21	0	0	29	0	50	26	14	54	46
	18	14	0	0	0	0	0	14	0	18	28	33	6	85	71	49	69	31
	19	8	7	5	0	0	0	20	0.4	40	18	22	0.2	80	270	215	79	21
	Average	29	4	7	0	0	0	40	4	11	9	34	2	60	83 M . V. 74.4 Med. 31	58 63 14	52 18 70	48

TABLE III

PER CENT OF ASSOCIATIONS IN EACH CLASS.

Dementia Praecox Case	Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
20	0	0	0	0	0	0	0	54	0	0	46	0	100	112	111	99	1
21	20	25	12	0	0	0	57	23	0.6	0.6	16	1	41	178	167	94	6
22	0	0	74	0	0	0	74	26	0	0	0	0	26	35	34	99	1
23	11	75	0	0	0	0	86	3	2	2	5	2	14	82	57	70	30
24	0.6	73	0.3	0	0	0	74	11	15	0	0	0	26	330	310	94	6
25	0	47	12	0	0	0	59	6	26	4	4	0	40	120	49	41	59
26	8	0	23	0	8	0	39	0	0	8	45	8	61	24	13	54	46
27	0	0	0	0	0	0	0	1	99	0	0	0	100	97	96	99	1
28	6	0	0	0	0	0	6	63	29	0	2	0	94	219	209	95	5
Average	5	24.4	13.4	0	0.9	0	44	20	19	1.6	13	1	56	133	116	83	17
														M. V. 73	75	18	
														Med. 112	96	94	

TABLE IV.

PER CENT OF ASSOCIATIONS IN EACH CLASS.

Secondary Dementia Case	Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
29	1	69	0	0	0	0	70	0	30	0	0	0	30	173	168	97	3
30	25	0	10	0	5	0	40	5	0	0	50	5	60	41	20	49	51
31	8	0	0	0	0	0	8	0	0	16	63	13	92	31	24	77	23
32	6	33	5	0	0	0	44	0	8	0	46	2	56	104	60	58	42
33	0	100	0	0	0	0	100	0	0	0	0	0	0	269	256	95	5
34	22	56	0	0	0	0	78	11	3	6	2	0	22	136	93	68	32
35	37	11	0	0	0	0	48	42	8	0	2	0	52	59	46	78	12
36	0	100	0	0	0	0	100	0	0	0	0	0	0	28	5	17	83
37	0	43	2	0	0	0	45	1	6	39	6	2	54	86	82	95	5
Average	11	46	2	0	0.5	0	60	7	6	7	19	2	40	103	84	70	30
														M. V. 60	53	20	
														Med. 86	60	77	

TABLE V.

PER CENT of ASSOCIATIONS IN EACH CLASS.

Miscellaneous Case		Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
Melancholia	38	85	0	15	0	0	0	100	0	0	0	0	0	0	70	7	10	90
"	39	0	0	62	0	0	0	62	0	13	0	25	0	38	34	8	23	77
Senile Dementia	40	66	0	18	3	0	0	87	0	0	0	13	0	13	60	29	48	52
" "	41	0	3	0	0	0	0	3	1	94	0	2	0	97	203	201	99	1
Paranoia	42	0	0	9	0	0	0	9	0	9	0	69	13	91	73	32	43	57
"	43	3	0	73	1	0	0	77	0	1	1	20	0	22	104	67	64	36
Post Febrile	44	20	0	10	0	0	0	30	3	4	3	59	0	69	234	208	89	11
Psychasthenia	45	3	0	67	12	9	0	91	0	0	2	6	0	8	90	86	96	4

TABLE VI.

NUMBER OF INDIVIDUALS GIVING THEIR LARGEST PER CENT OF ASSOCIATIONS IN THE FOLLOWING CLASSES.

Insane Groups.	Contiguity	Sentence Form	Coördination	Speech Habit	Repetition	Alliteration	Total Cases in each Group
Manic Depressive Excited	3	7	0	3	0	1	14
" " Depressed	1	0	0	0	1	3	5
Dementia Praecox	0	4	1	2	1	1	9
Secondary Dementia	0	5	0	1	0	3	9
Melancholia	1	0	1	0	0	0	2
Senile Dementia	1	0	0	0	1	0	2
Paranoia	0	0	1	0	0	1	2
Psychasthenia	0	0	1	0	0	0	1
Post Febrile Psychosis	0	0	0	0	0	1	1
Total	6	16	4	6	3	10	45
Normal Group "	9	0	0	1	0	0	10

TABLE VII.

PER CENT OF ASSOCIATIONS IN EACH CLASS.

Normal Group / Subject	Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
1	71	0	10	5	1	1	88	5	0.5	0.3	5	0.5	12	301	288	96	4
2	54	14	15	5	0	5	93	0.5	0	1	4	0	6	242	202	83	17
3	45	1	30	5	0.3	10	92	0	1	2	3	2	8	280	257	90	10
4	93	2	2	1	0.5	0	99	0	0	0	1	0	1	190	180	90	10
5	13	1	15	3	0.4	6	38	52	0	1	9	0.3	62	257	216	84	16
6	51	0	28	7	0	0	86	1	0	1	9	3	14	162	138	85	15
7	53	3	26	5	0	5	92	3	0	0	4	0	7	157	142	90	10
8	45	0	25	5	2	5	82	1	2	4	11	0	18	128	108	84	16
9	56	4	9	12	0	16	97	1	0	1	0	0	2	171	151	88	12
10	38	24	14	9	0.4	9	95	1	0	0	3	0.4	5	230	180	78	22
Average	51.9	4.9	16.4	5.7	0.46	5.7	86.3	6.45	0.35	1.03	4.9	0.62	13.5	212	186	86.8	13.2
														M. V. 50	43.6	4	
														Med. 210	180	86	

TABLE VIII.

Per Cent of Associations in Each Class.

Insane and Normal Groups.	Contiguity	Sentence Form	Coördination	Subordination	Surordination	Judgment	Total Ideational	Speech Habit	Repetition	Rhyme	Alliteration	Assonance	Total Sensorial	Total Words in List	Total Associations in List	Per cent of Associations	Per cent of Non-Associations
Manic Depressive Excited	14	45	9	0.35	0.18	0.35	69	14	5	4	7	0.5	31	171	153	86	14
" " Depressed	29	4	7	0	0	0	40	4	11	9	34	2	60	83.4	58	52	48
Dementia Præcox	5	24.4	13.4	0	0.9	0	44	20	19	1.6	13	1	56	133	116	83	17
Secondary Dementia	11	46	2	0	0.5	0	60	7	6	7	19	2	40	103	84	70	30
Miscellaneous Cases	22	.04	32	2	1	0	58	0.4	13	0.7	24	2	41	108.5	79.7	59	41
Total Average—Insane	16	24	13	0.47	0.52	0.07	54.4	9	10	4.4	19	2	45.6	120	98	70	30
" " Normal	51.9	4.9	16.4	5.7	0.46	5.7	86.3	6.4	0.35	1.03	4.9	0.62	13.5	212	186	86.8	13.2

TABLE IX.

PER CENT OF WORDS IN EACH CLASS.

Manic Depressive Insanity (Excited) Case	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
1	3	0	20	2	6	5	7	56	358
2	88	0	0	0	3	7	0	2	77
3	3	0	4	0	5	8	12	67	94
4	2	0	11	0	0	3	1	83	135
5	8	0	2	8	44	11	3	24	241
6	2	0	5	1	9	10	16	56	259
7	1	0	7	5	1	1	7	77	228
8	0	0	4	0	2	21	3	69	288
9	14	1	0	46	8	0	1	29	179
10	10	0	7	5	36	28	7	7	73
11	13	0	1	1	11	2	4	68	202
12	10	7	0	2	1	13	38	28	116
13	2	0	10	0	15	5	0	68	99
14	0	0	0	0	10	2	85	2	40
Average	11	15	5	5	10	8	13	45	171

TABLE X.

PER CENT OF WORDS IN EACH CLASS.

Manic Depressive Insanity (Depressed) Case	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
15	74	0	0	0	6	16	0	3	31
16	37	0	0	16	26	5	16	0	19
17	30	0	4	0	27	19	0	19	26
18	3	0	0	0	7	20	7	63	71
19	3	0	0	0	9	12	0.3	65	270
Average	29.4	0	0.8	3	17	14	4.6	30	83

TABLE XI.

PER CENT OF WORDS IN EACH CLASS.

Dementia Præcox. Case	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
20	0	0	0	0	0	0	100	0	112
21	2	0	0	1	12	25	22	37	178
22	0	0	0	0	0	100	0	0	35
23	14	0	0	1	9	14	9	50	82
24	2	0	0	0	0	3	3	90	330
25	11	0	0.8	4	8	14	24	37	120
26	33	0	0	0	4	33	0	29	24
27	0	0	0	0	0	0	100	0	97
28	0	0	0	0	0.4	2	10	87	219
Average	7	0	0.08	0.6	4	21	30	37	133

TABLE XII.

PER CENT OF WORDS IN EACH CLASS.

Secondary Dementia Case	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
29	0	0	4	3	0	9	0	84	173
30	41	0	0	0	39	19	0	0	41
31	0	0	0	4	34	43	0	19	31
32	0	0	0.2	0	0.2	13	51	34	104
33	1	0	11	0	1	12	0.5	74	269
34	2	0	0	2	12	22	10	50	136
35	6	0	0	0	3	5	76	8	59
36	71	0	0	0	0	4	0	25	28
37	16	0	1	0	0	36	0	46	86
Average	15	0	2	1	10	18	15	38	103

TABLE XIII.

Per Cent of Words in Each Class.

Miscellaneous Cases. Cases		Immediate Environment	Subject	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
Melancholia	38	90	0	0	0	10	0	0	0	70
Melancholia	39	55	0	0	5	26	12	2	0	34
Senile Dementia	40	47	0	0	5	12	36	0	0	60
Senile Dementia	41	3	0	0	0	0	0	1	95	203
Paranoia	42	16	0	0	0	0	45	0	38	73
Paranoia	43	26	0	0	1	62	0	0	1	104
Post Febrile Psy.	44	11	0	0	0	32	35	0	20	234
Psychasthenia	45	0	0	0	0	42	21	35	1	90
Average		31	0	0	1	23	19	5	19	108

TABLE XIV.

PER CENT OF WORDS IN EACH CLASS.

Normal Group. SUBJECTS	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
1	0	10	2	6	37	30	12	3	301
2	18	0	26	0	35	6	1	14	242
3	10	28	9	2	22	9	1	19	280
4	21	0	26	1	24	2	25	1	190
5	9	1	1	0	17	59	1	11	257
6	26	0	7	1	64	1	0	1	162
7	6	0	23	6	20	14	27	3	157
8	8	0	16	9	58	2	0	6	128
9	13	1	21	8	32	15	2	8	171
10	19	5	9	3	29	3	5	27	230
Average	13	4.5	14	3.6	33.8	14.1	7.4	9.3	212

TABLE XV.

PER CENT OF WORDS IN EACH CLASS.

Insane and Normal Groups	Immediate Environment	Subjects	Personal Experience	World Environment	World Objects	Concepts	Proper Names	Parts of Speech	Total Words
Manic Depressive Excited	11	1	5	5	10	8	13	45	171
Manic Depressive Depressed	29	0	1	3	17	14	5	30	83
Dementia Præcox	7	0	0	1	4	21	33	37	133
Secondary Dementia	15	0	2	1	10	18	15	38	103
Miscellaneous Cases	31	0	0	1	23	19	5	19	109
Average—Insane	19	0.1	2	2	13	16	14	34	120
Average—Normal	13	5	14	4	34	14	7	9	212

TABLE XVI.

NUMBER OF SUBJECTS WRITING IN 15 MINUTES

Insane and Normal Subjects	Less than 25 Words	25-50 Words	50-100 Words	100 -200 Words	200-300 Words	300-400 Words	Total Subjects
Manic Depressive Excited	0	1	3	4	5	1	14
" " Depressed	1	2	1	0	1	0	5
Dementia Præcox	1	0	3	3	2	0	9
Secondary Dementia	0	3	2	3	1	0	9
Senile Dementia	0	0	2	0	0	0	2
Melancholia	0	1	1	0	0	0	2
Paranoia	0	0	1	1	0	0	2
Psychasthenia	0	0	1	0	0	0	1
Post Febrile Psychosis	0	0	0	0	1	0	1
Total Insane	2	7	14	11	10	1	45
Normal Group				5	4	1	10

TABLE XVII.

RATE OF THOUGHT, SHOWING EFFECT OF PRACTICE AND FATIGUE.

Insane and Normal Groups.	Continuous Increase	Continuous Decrease	Increase then Decrease	Decrease then Increase	Equal	Increase then Equal	Decrease then Equal	Equal then Increase	Equal then Decrease	Total Subjects
Manic Depressive Excited	2	1	1	6	2	0	0	2	0	14
" " Depressed	1	1	1	1	0	0	0	0	1	5
Dementia Præcox	2	2	1	2	2	0	0	0	0	9
Secondary Dementia	1	2	1	2	0	1	0	0	2	9
Senile Dementia	0	0	0	1	0	1	0	0	0	2
Paranoia	0	1	1	0	0	0	0	0	0	2
Melancholia	0	1	0	0	0	0	0	1	0	2
Psychasthenia	0	0	1	0	0	0	0	0	0	1
Post Febrile Psychosis	0	0	0	1	0	0	0	0	0	1
Total—Insane	6	8	6	13	4	2	0	3	3	45
Total—Normal	2	2	1	3	0	0	1	0	1	10

TABLE XVIII.

NUMBER OF SUBJECTS WRITING GREATEST NUMBER OF WORDS IN

Insane and Normal Groups.	First 5 Minutes	Second 5 Minutes	Third 5 Minutes	Three Periods Equal	First & Second Periods Equal	Second & Third Equal]	Total Subjects
Manic Depressive Excited	5	1	7	0	0	1	14
" " Depressed	2	1	1	0	1	0	5
Dementia Præcox	5	1	1	2	0	0	9
Secondary Dementia	3	1	2	0	2	1	9
Senile Dementia	0	0	2	0	0	0	2
Melancholia	2	0	0	0	0	0	2
Paranoia	1	1	0	0	0	0	2
Psychasthenia	0	1	0	0	0	0	1
Post Febrile Psy.	1	0	0	0	0	0	1
Total Insane	19	6	13	2	3	2	45
Total Normal	4	1	4	0	1	0	10

TABLE XIX.

APPROXIMATE LENGTH OF LONGEST TRAIN OF ASSOCIATED WORDS.

Insane and Normal Groups	Less than 10	10-25	25-50	50-100	100-200	Total Subjects
Manic Depressive Excited	1	3	4	3	3	14
" " Depressed	4	1	0	0	0	5
Dementia Præcox	2	1	2	2	2	9
Secondary Dementia	2	3	2	2	0	9
Senile Dementia	1	0	0	0	1	2
Paranoia	0	1	1	0	0	2
Melancholia	2	0	0	0	0	2
Psychasthenia	0	0	1	0	0	1
Post Febrile Psychosis	0	0	0	1	0	1
Total Insane	12	9	10	8	6	45
Total Normal	0	0	6	3	1	10

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